

What is claimed is:

1. An optical semiconductor device comprising:
  - an InP substrate;
  - a plurality of layers, stacked on the InP substrate, including a multi-quantum well active layer made of InGaAlAs;
  - an InAlAs electron stopping layer stacked on the plurality of layers;
  - an InGaAsP layer including a grating stacked on the InAlAs electron stopping layer; and
  - an InP cladding layer stacked on the InGaAsP layer; wherein a concave depth of the grating included in the InGaAsP layer is smaller than a thickness of the InGaAsP layer.
2. An optical semiconductor device comprising:
  - an InP substrate;
  - a plurality of layers, stacked on the InP substrate, including a multi-quantum well active layer made of InGaAlAs;
  - an InAlAs electron stopping layer stacked on the plurality of layers;
  - an InGaAsP layer including a grating stacked on the InAlAs electron stopping layer;
  - an InP spacer layer stacked on the InGaAsP layer;
  - an InGaAsP etch stopping layer stacked on the InP

spacer layer; and

an InP cladding layer stacked on the InGaAsP etch stopping layer;

wherein a concave depth of the grating included in the InGaAsP layer is smaller than a thickness of the InGaAsP layer.

3. An optical semiconductor device according to claim 2, wherein the spacer layer comprises an InAlAs layer.

4. An optical semiconductor device according to claim 1, wherein a composition wavelength of the InGaAsP layer including the grating is not shorter than 1.15  $\mu\text{m}$  and not longer than 1.24  $\mu\text{m}$ .

5. An optical semiconductor device according to claim 2, wherein a composition wavelength of the InGaAsP layer including the grating is not shorter than 1.15  $\mu\text{m}$  and not longer than 1.24  $\mu\text{m}$ .

6. An optical semiconductor device according to claim 3, wherein a composition wavelength of the InGaAsP layer including the grating is not shorter than 1.15  $\mu\text{m}$  and not longer than 1.24  $\mu\text{m}$ .

7. An optical semiconductor device according to claim 1, wherein a portion of the InGaAsP layer including the grating consists of a multi-quantum well layer.

8. An optical semiconductor device according to claim 2, wherein a portion of the InGaAsP layer including the grating consists of a multi-quantum well layer.

9. An optical semiconductor device according to claim 3, wherein a portion of the InGaAsP layer including the grating consists of a multi-quantum well layer.

10. An optical semiconductor device according to claim 1, wherein impurity dopants including Si and/or O exist between the InP cladding layer and the InGaAsP layer including the grating.

11. An optical semiconductor device according to claim 2, wherein impurity dopants including Si and/or O exist between the InP spacer layer and the InGaAsP layer including the grating.

12. An optical semiconductor device according to claim 1, wherein the optical semiconductor device is a ridge type laser in which the InP cladding layer has a shape of a ridge mesa stripe.

13. An optical semiconductor device according to claim 2, wherein the optical semiconductor device is a ridge type laser in which the InP cladding layer has a shape of a ridge mesa stripe.

14. An optical semiconductor device according to claim 1, wherein the optical semiconductor device is a buried type laser.

15. An optical semiconductor device according to claim 1, wherein the optical semiconductor device is an integrated light source in which a laser structure and an electro-absorption modulator are integrated.

16. An optical semiconductor device according to claim 2, wherein the optical semiconductor device is an integrated light source in which a laser structure and an electro-absorption modulator are integrated.

17. An optical semiconductor device according to claim 13, wherein the optical semiconductor device is an integrated light source in which a laser structure and an electro-absorption modulator are integrated.

18. An optical semiconductor device according to claim 14, wherein the optical semiconductor device is an integrated light source in which a laser structure and an electro-absorption modulator are integrated.

19. An optical semiconductor device according to claim 1, wherein the optical semiconductor device is an integrated light source in which a laser structure and a Mach-Zender modulator are integrated.

20. An optical semiconductor device according to claim 2, wherein the optical semiconductor device is an integrated light source in which a laser structure and a Mach-Zender modulator are integrated.